

SEEKING NEW TURTLES IN NORTH AMERICA

CHAD ARMENT

On the face of it, you'd think turtle (and tortoise) species would be fairly easy to locate and describe, and that in such a well-explored continent as North America, we should have found most of them in the early years of scientific exploration. After all, most are large enough to visually locate from a distance, and they certainly aren't difficult to handle. But, the facts show that turtle systematics is an active field and new species are still being recognized. As Lovich and Gibbons noted (1997), "In the United States and Canada, the number of recognized species of turtles has increased by 48% in less than 45 years. . . . The number of subspecies has also increased." Not all species were previously unrecognized, of course. Many times, a turtle occupied subspecific status before being elevated to full species. But, sometimes the description offers a bit of a surprise.

Several cases over the last couple decades are worth pointing out.

1) Joseph T. Collins wrote a paper in 1991 proposing 55 hypothetical North American reptile and amphibian species, arguing that application of the evolutionary species concept allowed for distinctive lineages to be hypothesized, and thus tested, as species. Four of these were turtles. (Crother 2014) a) *Kinosternon arizonense*, the Arizona mud turtle was originally described as a fossil species, then became

a subspecies of *K. flavescens* (Ernst and Lovich 2009). It was elevated to full species. b) *Kinosternon spooneri* was falsified, and it is still considered a subspecies of *K. flavescens*. c) *Pseudemys gorzugi*, the Rio Grande cooter was formerly considered a subspecies of the river cooter, *P. concinna*, but is now considered a distinct species (Ernst and Lovich 2009). d) *Pseudemys suwanniensis* was falsified, and is still a subspecies of *P. concinna*.

2) *Graptemys pulchra* was split into several species as lineages were distinguished in different river drainage systems (Lovich and McCoy 1992). Even then, *Graptemys gibbonsi* was thought to inhabit both the Pearl River and Pascagoula River, until the Pearl River map turtle was determined to be a new species, *Graptemys pearlensis* (Ennen et al 2010).

3) *Graptemys ouachitensis sabinensis* was elevated to full species status (*Graptemys sabinensis*) based on its allopatric distribution along with recognizable physical and genetic differentiation (Lindeman 2013).

4) CNAH (2013b) noted two different papers recently published that elevated the Florida mud turtle *Kinosternon subrubrum steindachneri* to full species status (*K. steindachneri*).

5) In one paper Spinks and Shaffer (2005) showed that the two recognized subspecies of the western pond turtle *Emys marmorata* did not show a complete picture of the species, that there were in fact four different phylogenetic clades within the species. Three had been previously described as the two subspecies along with a zone of intergradation, but it

was suggested that these four clades could each be phylogenetic species, though further research was warranted. Spinks, Thomson, and Shaffer (2014) then went on to show that there was a species-level distinction, leading to both *Emys marmorata* and *E. pallida*. A third clade in Baja California was left undescribed, but is possibly a separate species.

6) Thomas et al (2014) used morphological and genetic differentiation to split the alligator snapping turtle into three species occupying different river drainages. *Macrochelys temminckii* remains the western lineage, *M. apalachicola* (Apalachicola alligator snapping turtle) is the central lineage, and *M. suwanniensis* (Suwannee alligator snapping turtle) is the Florida endemic eastern lineage. Genetically distinguishable populations in the alligator snapping turtle were recognized as early as Roman et al (1999), who sampled twelve river systems and distinguished eleven haplotypes (eight of which were river-specific). The Suwannee population was specifically noted as also being morphologically divergent at that time. Additional research supports the three main lineages described (Murray et al 2014).

7) Martin et al (2013) suggested placing three box turtle subspecies of *Terrapene carolina* into their own clade, to become *T. mexicana triunguis*, *T. m. mexicana*, and *T. c. yucatana*. CNAH (2013) pointed out that as these three subspecies are “morphologically and molecularly distinct allopatric populations,” they should each be elevated to full species status.

8) The recently described Morafka’s desert tortoise (*Gopherus morafkai*) is distinguishable from other

Gopherus species genetically and morphologically, though in captive tortoises this may not be possible due to extensive hybridization (Murphy et al 2011).

So, seeing that it is still possible to find a new species, surely it is a simple matter to spend a little time in the field and find something distinctive, right? After all, they're just turtles . . . Well, not so much.

For one thing, collecting is not always a simple proposition. For many years, certain families, like map turtles, were not as common in collections, because many are very wary in the wild or live in habitats (fast or deep rivers) that make collecting difficult (Cagle 1952). New techniques had to be developed to adequately survey some rivers.

Beyond that, there's a reason that so many species hide "in plain sight" as undifferentiated members of a known species complex. Some turtle species complexes have caused a great deal of taxonomic confusion, as some phenotypic traits are quite variable and may or may not be consistent among all members of a group (Lamb and Lovich 1990; Leary et al 2008). Seidel (1981) noted that "pigmentation in cooters has little systematic value," as pigmentation and facial markings can be influenced by environmental factors. Map turtle head markings, for example, are known to change by varying egg incubation temperatures (Seidel 1981). Some variations (including differences in the shell) can be clinal (Ennen et al 2014), or due to local environments (e.g. turbulent waters can reduce shell height (Lovich and McCoy 1992)).

Hybridization is well known for causing taxonomic confusion in turtles (Ford and Shi 2001), and certain families (as with *Pseudemys*) require careful attention to ascertain the influence of hybrid swarms (Jackson, Nelson, and Morris 2012) on unusual-looking populations. Out-of-place populations are also known, as turtles are often transported and released in new habitats by people who don't know any better. One such population is a group of Florida red-bellied cooters at *Pseudemys nelsoni* in the manmade Spring Lake of San Marcos, Texas. Rose et al (1998) considered

the possibility that this population represented a new species, but noted, “There appears to be no external morphological character(s) that distinguish individuals from Spring Lake from those found in Florida.” Further research was planned, but apparently found nothing unusual.

Despite these issues, herpetologists understand the necessity for continually examining the evidence for new species. They recognize that “covert” species (Lovich and Gibbons 1997) “are those that (1) are hidden by faulty taxonomy, (2) possess significant intraspecific genetic variation, (3) have sibling species with poorly known distributions, or (4) are undescribed.” If valid species are hidden because current taxonomy doesn’t recognize them as distinctive from larger-ranging species, the smaller unrecognized populations are more vulnerable to habitat loss or loss from outside sources (Murphy et al 2011; Thomas et al 2014). Biological studies based on one species can be mistakenly applied to a covert species as Ennen et al (2010) point out: “The phenomenon of cryptic or unrecognized species has been identified as a major concern in conservation biology. . . . Compounding management concerns is that, even after the recognition of cryptic taxa, there usually is a lack of basic ecological knowledge for newly described species because earlier work on a group with broad-ranging taxa was typically assumed to be applicable to the rest of its range. These scenarios are especially relevant to the southeastern United States where researchers are still describing new species from taxa previously believed widespread.”

So, where might we see new turtle species being located?

1) I ran across this notation in a USFWS paper: “The early record of the Alabama red-bellied turtle from the Tchoutacabuoffa River in Mississippi and four specimens captured more recently in the Pascagoula River in Mississippi are believed to be an undescribed member of the *P. rubriventris*-*P. nelsoni*-*P. alabamensis* complex. This suspected new taxon is currently being studied by Dr. James Dobie” (Dobie

and Bagley 1990). Years later, this status of this population was still undetermined. “The southeastern Mississippi population differs slightly morphologically but is not recognized as a distinct taxon; genetic phylogeographic analysis is needed” (Leary et al 2008).

2) Kevin Stewart instigated this article by mentioning to me that herpetologist James Butler thought there might be a covert species of mud turtle in Florida, based on research published years ago (Ernst et al 1974). As we saw previously, the Florida mud turtle is now considered a distinct species, *K. steindachneri*.

3) Map turtles seem a good bet when looking at groups with potential new species. There are several smaller independent Gulf river systems with unconfirmed reports of *Graptemys* (e.g. Biloxi River, Tickfaw River) (Ennen et al 2010). These may simply be known species, but would certainly be worth chasing down.

4) Chris Lechowicz (2004) noted he often found two different map turtle species living side by side in southeastern rivers, one a narrow-headed species and the other having a broader head. “By example of *G. nigrinoda*/*G. pulchra* and *G. flavimaculata*/*G. gibbonsi* and *G. oculifera*/*G. gibbonsi*, there should be another narrow-head species in the Escambia drainage. I set out to look for that species with no luck. I heard rumors in the late 90’s about this and spent some time looking for it in the Escambia, Sepulga etc., but all that was found was *G. ernsti*.”

5) Paul Krusling has been investigating map turtles in Ohio. I heard him speak at the 2014 Ohio Reptiles conference co-sponsored by ODNR and the Ohio Biological Survey, where he mentioned seeing a possible new map turtle. When I followed up, he noted (pers. comm.) that he believed Ohio had four different map turtles. The known species are the northern map (*Graptemys geographica*), the Ouachita map (*Graptemys ouachitensis*), and the false map turtle (*Graptemys pseudogeographica pseudogeographica*). (The latter is a Species of Concern in Ohio.) “My program at the recent Ohio Reptiles meeting was to point out that at least two additional forms of *Graptemys pseudogeographica*, (*pseudogeographica* and *kohnii*?) occur in the lower Great Miami River. I am not an expert on turtle taxonomy. That being said, there are definitely *G. p. pseudogeographica* based on typical head patterns and medium-sized heads on the females, and *G. p. kohnii* [Mississippi map turtle], based on large-headed females with post orbital crescents. The large-headed *kohnii* type, however do not conform to more typical *kohnii* of say eastern Arkansas or Reelfoot Lake, and may be distinct. Some of the differences include dark eyes, while the southern forms have white irises; they also frequently have incomplete crescents while this is unusual in southern *kohnii*. Both typical *G. p. kohnii* and *G. p. pseudogeographica* occur in Reelfoot Lake which says to me they are a distinct species. The *G. p. ‘kohnii’* of the Great Miami River may be another new member of this confusing group. There could be other explanations, such as both forms are/were present and the large-headed forms with incomplete crescents are interspecific hybrids of recent origin. In any case this is also newsworthy.”

6) It's probably unlikely that any further alligator snapping turtle species will be described, but there is always the possibility for smaller river drainages with isolated populations to be further differentiated. Murray et al (2014) note the lack of conformity to the main lineages with specimens from the Perdido River, for example.

7) There is still a possible cryptic taxon within *Gopherus morafkai* populations (e.g. "a potentially new Sinaloan thornscrub tortoise") (Murphy et al 2011).

Any of these (or others) might be in the process of description, particularly where specimens have already been obtained. There is always a lack of funding, sometimes a lack of personnel, in the investigation of new species, and as Lovich and Gibbons (1997) state, "Some new species are known by individual investigators who have not published the formal descriptions." There are however possible directions for the amateur herpetologist, so long as any collecting follows state and Federal guidelines. There are herpetologists who are willing to work with non-professionals (though there are, admittedly, a few who aren't as keen). The main thing they don't want to see are amateurs re-arranging herps systematically or describing new taxa on poor evidence without qualified peer-review (Kaiser et al 2013).

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